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BY JOSEPH B. KAHN.

HYDRAULICS.
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A NEW RATE-MAKING BASIS.
BY MAX THELEN.

BROADWAY BRIDGE—PORTLAND, ORE.
BY F. D. WEBER AND F. H. MURPHY.

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JOURNAL OF ELECTRICITY
POWER AND GAS
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VOLUME XXXI SAN FRANCISCO, NOVEMBER 22, 1913 NUMBER 21

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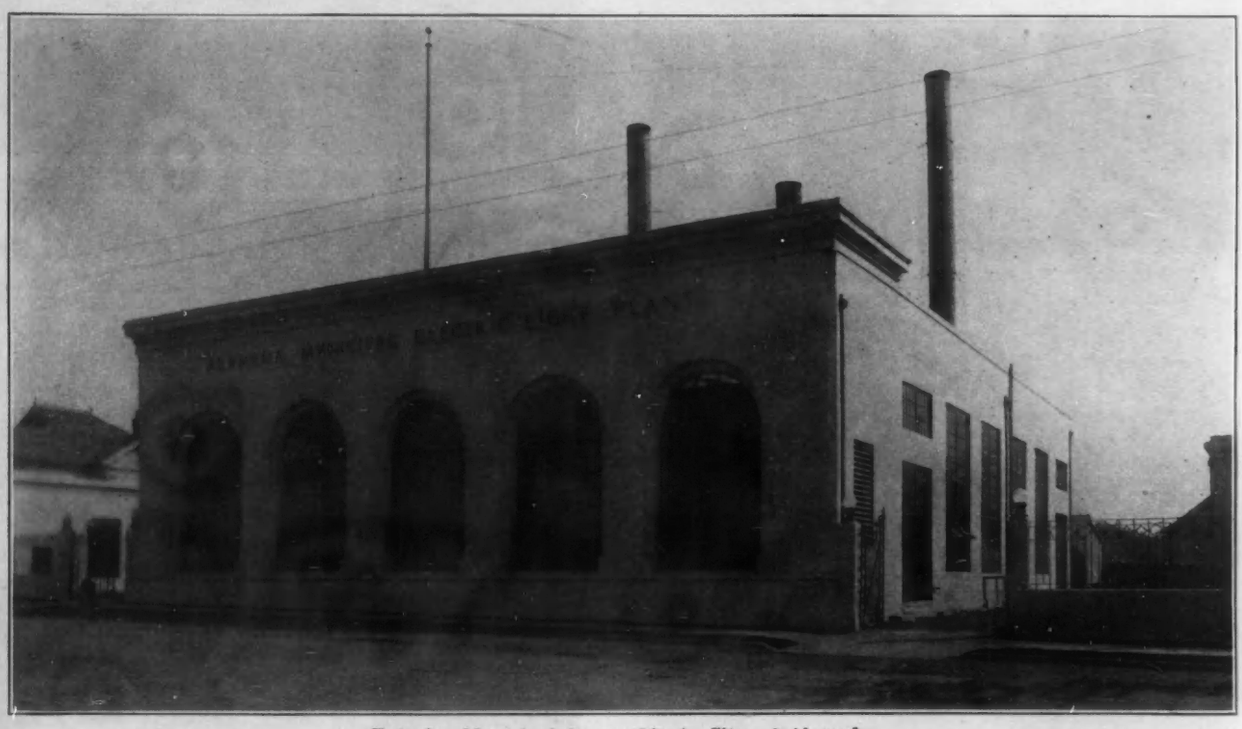
ALAMEDA MUNICIPAL ELECTRIC LIGHT PLANT

BY JOSEPH B. KAHN

(The early history is first touched upon by the author, who then describes the recently installed plant and many interesting features in connection with its erection and operation. The system of residence street lighting is also mentioned, and a reason is given for the signal success of the public ownership of this particular plant. Mr. Joseph B. Kahn is the superintendent of the City of Alameda Department of Electricity.—The Editor.)

The Municipal Electric Light Plant of the City of Alameda, California, started in 1890, was for many years operated only as a street lighting system. It was not until 1904 that the city embarked in the commercial lighting business, and then only in a haphazard way. In the year 1905 a 24-hour service was inaugurated and the history of the plant as a commercial enterprise started from that time. The confidence of the citizens in this public-owned utility is expressed in its steady growth and the loyalty shown to the plant through its many trying periods. In 1905 the plant consisted of 1-360 h.p. Buckeye cross-compound engine belted to a 250 kw. Stanley 2-phase induction type generator, and a 90 kw. Stanley generator served by a 150 h.p. Ohmen engine, with a full complement of return tubular boilers. All the plant of that date has been discarded. At the present time, the plant is of modern construction throughout, consisting of 1-500 kw. Westinghouse Parsons turbine, 1-1250 kw. Westinghouse Parsons turbine, one 4-valve Fleming-Harrisburg engine direct connected to one 275 kw. National generator, one piston valve Fleming-Harrisburg engine direct connected to one 240 kw. National generator.



Exterior Municipal Power Plant—City of Alameda.

All generators are 2-phase, 60 cycle 2400 volt, and all engines condensing—condenser of the Worthington type, with Blake air pump.

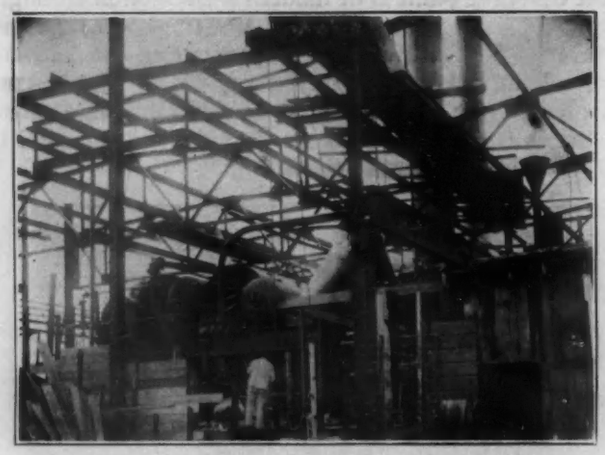
The boilers consist of 2-300 h.p. Stirling and 4-250 Heine boilers, all water tube, carrying 175 lb. pressure and equipped with super-heaters.

All drain and condensing water from condenser are carried to the hot well, and then through closed meter and coil-heater to boilers.

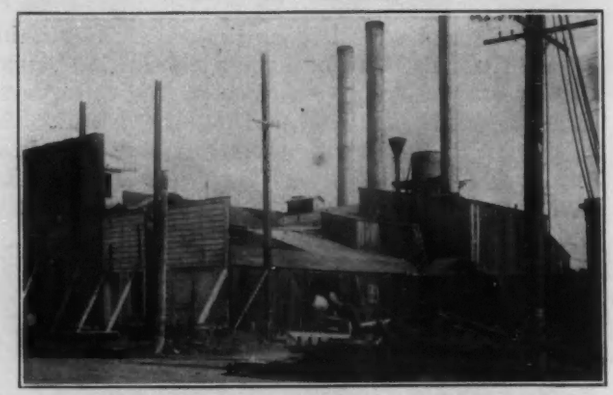
A deep well Dorward motor driven pump sup-

Exterior View of the Plant Secured in 1890.

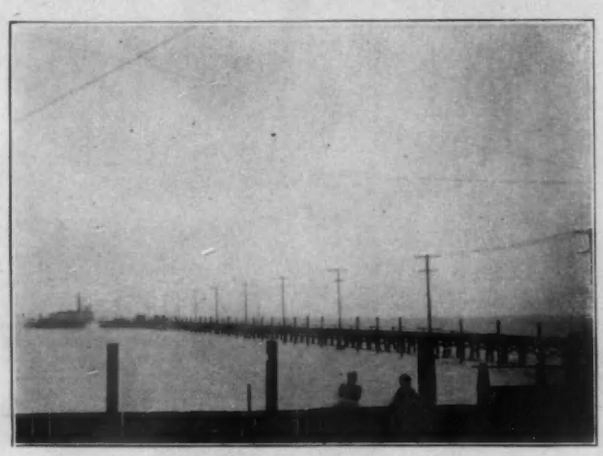
Interior View of Street-Lighting Plant, 1890.



The Old Plant Kept in Operation During Rebuilding.



Plant at Commencement of Reconstruction, 1912.



1500 Ft. Pipe Line for Fuel Oil and Saltwater.

Battery of Boilers in New Plant.

plies make up water and other water for station work. A continuous record of the flue gases is kept by use of a carbon dioxide meter.

The switch-board is of the General Electric type, with bell crank handles operating the switches in compartments in an upper gallery, with a double bus bar arrangement. Circuits are all protected with time limit relays, all feeders have a feeder regulator, which automatically regulates the voltage on each.

The people of Alameda voted the necessary $150,000 for doubling the capacity and for the improvement of this plant in April, 1912, and in December, 1912, construction was commenced. The old building was a ramshackle wooden structure, and the new Class "A" building of steel and reinforced concrete was built around it. Continuous service was essential and was secured during the process of reconstruction, notwithstanding the difficulties encountered, some idea of

Interior View of New Plant.

which can be gathered from the accompanying illustrations.

The assets of the plant now exceed $511,000 and its annual income from public and private lighting and power is $120,745. The net profit last year after deducting all operating maintenance, depreciation and interest charges was $47,538.80. The service is excellent, the voltage variation not exceeding 2 per cent.

The rates for power range from 2c per kw.-hr. to 5c per kw. according to load factor, and from 5c to 7c per kw.-hr for lighting.

The following abstracts from the last annual report will prove of general interest in addition to their value as statistical evidence of the progress of the plant:

Report of Municipal Electric Light Plant for Year Ending June 30, 1913.

EARNINGS.

City incandescent		$ 29,511.28
City arcs		4,196.52
Commercial and private lighting		84,939.45
Commercial and private power		14,615.85
Wiring permits		940.00
Miscellaneous earnings, labor, supplies, etc		3,899.10
		$138,102.20
Less discount	$2,368.95	
Bad debts	106.65	2,475.60
Total gross earnings		$135,626.60

EXPENDITURES.

Production Expense—		
Salaries and wages	$ 13,793.90	
Maintenance of machinery and tools.	2,439.74	
Fuel	17,796 60	
Lubrication	550.25	
Tests for foundations	704.30	
Other production expense	486.92	$ 35,771.71
Distribution Expense—		
Salaries and wages	$ 13,790.80	
Maintenance of lines	1,164.16	
Maintenance of street lamps	4,799.72	
Maintenance of line tools	110.19	
Maintenance of automobiles	1,188.50	
Other distribution expenses	1,439.14	$ 22,492.51
General Expense—		
Office salaries	$ 5,932.40	
Stationery and printing	986.69	
Other general expense	202.98	$ 7,122.07
Total cost of production		$ 65,386.29
Depreciation (average rate 6.25 per cent)		16,819.20
Interest		3,854.25
Taxes		2,028.00
Total cost of production		$ 88,087.74
Total gross earnings above		$135,626.60
Total cost of production		88,087.74
Net earnings carried to surplus		$ 47,538.86

Cash Balance.

Receipts—		
Cash in office of plant July 1, 1912	$ 616.53	
Collected from private consumers	105,033.82	
From wiring permits	944.00	
From deposits	1,498.00	
Fire alarm department	1,995.93	
Electroliers (City of Alameda)	10,656.74	
A. Webb	10.00	$120,745.02
Disbursements—		
Deposited with city treasurer	$119,635.49	
Deposits returned	373.00	
Cash returned to consumers	7.60	
Wiring permits cancelled	4.00	
Cash in office of plant July 1, 1913	724.93	$120,745.02

Balance Sheets.

Assets—	1913.	June 30th. 1912.	1911.
Plant	$360,099.29	$270,393.76	$275,726.38
Supplies on hand	2,163.33	2,524.33	1,395.07
Insurance paid in advance	373.06	1,198.90	1,508.00
Suspense	5,564.65	.....	.....
City Treasurer	29,453.56	18,900.49	5,814.98
Mun. Imp. Fund No. 10	67,226.54	.....	.....
Cash in office	724.93	616.53	360.33
Private consumers owe	9,451.50	8,557.50	8,021.85
Fire alarm department.	100.00	1,055.01	1,643.49
Watersi le Terrace Tract	149.34	.....	.....
City of Alameda	35,738.74	.....	.....
	$511,044.94	$303,246.52	$294,470.10

Liabilities—	1913.	June 30th. 1912.	1911.
City of Alameda	$.....	$ 38,131.67	$ 73,287.25
Bondholders No. 8	43,750.00	.....	.....
Bondholders No. 10	150,000.00	.....	.....
Sundry creditors	8,065.19	8,548.96	10,181.97
Deposits to be returned.	1,884.00	759.00	667.50
Surplus	307,345.94	255,806.89	210,333.38
	$511,044.94	$303,246.52	$294,470.10

Comparison of Cash Expenditures for Operation.

	Year to June 30, 1913.	Year to June 30, 1912.	Year to June 30, 1911.
Production Expense—			
Salaries and wages	$13,793.90	$11,622.70	$10,741.30
Maintenance of buildings	.....	47.36	78.31
Maintenance of mach & tools	2,439.74	2,564.04	1,993.44
Fuel	17,796.60	15,399.60	21,831.40
Lubrication	550.25	409.64	642.46
Tests for foundation	704.30	.....	.....
Other production expense	486.92	203.77	194.19
	$35,771.71	$30,347.11	$35,481.10
Distribution Expense—			
Salaries and wages	$13,790.80	$12,505.86	$ 9,670.72
Maintenance of lines	1,164.16	1,975.26	1,733.21
Maintenance of street lamps	4,799.72	3,082.09	2,553.28
Maintenance of line tools	110.19	273.50	32.53
Maintenance of automobiles	1,188.50	.....	.....
Other distribution expense	1,439.14	1,639.85	961.28
	$22,492.51	$19,476.56	$14,951.02
General Expense—			
Salaries and wages	$ 5,932.40	$ 4,907.70	$ 4,163.80
Stationery and printing	986.69	755.06	603.36
Other general expense	202.98	173.82	146.69
	$ 7,122.07	$ 5,836.58	$ 4,913.85

Comparative Statement of Earnings.

	Year to Jun. 30, 1913.	Year to Jun. 30, 1912.	Year to Jun. 30, 1911.
City arcs	$ 4,196.52	$ 13,904.00	$ 17,076.00
City incandescents	29,511.28	18,003.72	15,700.25
Commercial lighting	84,939.45	80,842.50	73,381.20
Commercial power	14,615.85	12,893.35	11,540.20
Wiring permits	940.00	892.00	778.00
Miscellaneous earnings, labor, supplies, etc..	3,899.10	2,714.30	3,459.57
	$138,102.20	$129,249.87	$121,935.22

Comparative Statement Miscellaneous.

	Year to June 30,1913.	Year to June 30,1912.	Year to June 30,1911
Electrical Output kw.-hr.	3,611,555	3,201,724	2,858,291
Fuel oil consumed, bbl...	29,661	25,766	25,811
Kw.-hr. generated per bbl.	121.8	124.3	110.8
Street lamps burned hours	3,526	3,487	3,486
Consumers gained	501	578	342
Total number of consumers	4,308	3,807	3,229
Cash cost of production on basis of kw.-hr. generated	.994	.945	1.24

Comparison of Expenditures for Construction.

	Year to June 30,1913.	Year to June 30,1912.	Year to June 30,1911
Land	$ 1,875.00	.....	.....
Buildings	25,800.71	.....	.....
Steam plant	51,189.04	16.67	21,713.38
Electric plant	10,953.15	.....	260.28
Wharf and pipe line	417.04	.....	.....
Shop tools	635.02	402.13	445.29
Wire	3,148.93	5,174.93	10,421.74
Pole and attachments....	1,710.31	3,853.89	6,064.19
Arc lamps	.....	25.24	504.20
Transformers	4,400.94	2,963.63	4,258.70
Meters	5,363.66	6,144.07	4,820.27
Services	1,965.37	1,901.12	1,695.77
Automobiles	6,041.51	.....	.....
Horses and wagons	.....	.....	265.00
Other distribution plant.	.....	6.25	64.30
Office furniture	315.80	16.55	.....
	$113,816.48	$ 20,504.48	$ 50,513.12

Plant Accounts, Debits.

Plant July 1, 1909	$213,093.48
Additions during year to June 30, 1910	25,310.32
Additions during year to June 30, 1911	50,513.12
Additions during year to June 30, 1912	20,504.48
Additions during year to June 30, 1913	113,816.48
Total amount charged to plant	$423,237.88

Contra.

Amount deducted for depreciation for year ending June 30, 1910	$ 8,379.00
Amount deducted for depreciation for year ending June 30, 1911	9,260.04
Amount deducted for depreciation for year ending June 30, 1912	17,388.60
Amount deducted account special depreciation on arc lamps (obsolete) year ending june 30, 1912.....	4,000.00
Amount deducted for depreciation for year ending June 30, 1913	16,819.20
Amount deducted account special depreciation on arc lamps (obsolete) year ending June 30, 1913.....	2,000.00
Amount deducted account of buildings torn down to adjust book account—year ending June 30, 1913..	4,000.00
Amount deducted account of horses and wagons to adjust book account—year ending June 30, 1913....	750.00
Amount deducted account of sale of horses and wagons—year ending June 30, 1913	541.75
Total amount deducted	$ 63,138.59
Balance present plant June 30, 1913	$360,099.29

Electrical Output Kilowatt Hours.

	Year to June 30, 1913.	Year to June 30, 1912.	Year to June 30, 1911.
July	239,707	209,795	182,008
August	268,429	238,050	206,860
September	269,256	250,825	221,117
October	326,148	289,602	258,004
November	348,056	302,212	267,830
December	377,321	323,684	296,222
January	356,505	318,304	290,123
February	272,676	278,233	239,365
March	314,260	275,099	246,237
April	289,839	253,681	222,244
May	284,387	238,141	227,522
June	264,971	224,098	200.759
	3,611,555	3,201,724	2,858,291

Fuel Oil Consumed, Barrels

	Year to June 30, 1913.	Year to June 30, 1912.	Year to June 30, 1911.
July	1,992	1,886	1,967
August	2,106	1,945	2,024
September	2,061	2,042	2,005
October	2,759	2,244	2,388
November	2,621	2,292	2,439
December	2,890	2,476	2,512
January	2,803	2,439	2,527
February	2,272	2,165	2,135
March	2,460	2,138	2,269
April	2,592	2,171	1,849
May	2,676	2,058	1,877
June	2,429	910	1,819
	29,661	25,766	25,811

Prices Paid for Fuel Oil.

July 1, 1909 to Feb. 1, 1910	$1.08 per bbl.
Feb. 1, 1910 to Feb. 19, 1911	1.00 per bbl.
Feb. 1, 1911 to July 1, 1913	.60 per bbl.

Current Generated per Barrel of Oil Kilowatt Hours.

	Year to June 30, 1913.	Year to June 30, 1912.	Year to June 30, 1911.
July	120.3	111.2	92.5
August	127.5	122.4	102.2
September	130.64	122.8	110.3
October	118.2	129.1	108.0
November	132.8	131.9	109.4
December	130.6	130.8	117,9
January	127.19	130.5	114.8
February	120.	128.5	112.1
March	127.7	128.7	108.5
April	111.8	121.5	120.2
May	106.3	115.7	121.2
June	109.1	117.3	110.4
Average for year	121.8	124.3	110.8

City Lighting—Number of Hours Street Lights Burned.

	Year to June 30, 1913.	Year to June 30,1912.	Year to June 30, 1911.
July	240	225	224
August	256	269	255
September	276	279	284
October	311	329	328
November	348	349	346
December	379	370	376
January	369	356	374
February	299	305	293
March	332	297	299
April	262	259	254
May	240	233	238
June	214	216	215
	3,526	3,487	3,486

Current Output and Sales.

	Kw.-hr.	Kw.-hr.
Generated		3,611,555
Sold private lighting	1,215,244	
Sold private power	374,676	
Used by City of Alameda street lighting and light in public buildings (estimated)..	1,080,916	
Used at electric plant	202,288	
Total accounted for		2,873,124
Loss in distribution		738,431

Loss in distribution, 20.4 per cent
Loss in distribution 23.8 per cent, 1912

Average Price Received Per Kw.-hr.

	This Year.	Last Year.
Private lighting	.0699	.0716
Private power	.0390	.0389
City lighting	.0312	.0372

Plant Accounts June 30, 1913.

Land	$ 4,875.00
Buildings	26,364.03
Steam plant	123,440.37
Electric plant	24,507.74
Well	611.00
Wharf and pipe line	417.04
Shop tools	1,735.18
Other prod. plant	353.16
Wire	62,801.31
Poles	21,866.95
Arc lamps	457.84
Incandescent apparatus	208.64
Transformers	24,051.86
Meters	43,343.34
Services	16,931.11
Automobiles	5,925.36
Line tools	394.68
Other dist. plant	546.06
Office furniture	1,268.62
Total	$360,099.29

Office of City Auditor.

The books of this office show that for the fiscal year ending June 30, 1913, the receipts and disbursements for the Municipal Electric Light Plant, have been as follows:

Electric Light Fund.

Balance: Cash on hand July 1, 1912	$ 18,900.49
Receipts from Sundry Sources	118,604.59
Total	$137,505.08
Total warrants allowed	109,201.52
Balance: Cash on hand July 1, 1913	28,303.56
Waterside Terrace Tract deposit	1,150.00
	$ 29,453.56

Municipal Improvement Fund No. 10—Electric.

Received from sale of bonds authorized April 12	$150,000.00
Total warrants allowed	82,773.46
Balance. Cash on hand July 1, 1913	$ 67,226.54

Fire Alarm Department—Expenditures.

Labor	$ 633.00
Fire Alarm Box	125.00
Supplies	272.92
Total	$1,030.92

Alameda is admitted to be the best lighted residence city in the United States. There are 4118-60 watt Mazda lamps on iron standards, placed 150 ft. apart, on each side of the street, staggered so that there is a lamp every 75 ft. The lamp post is

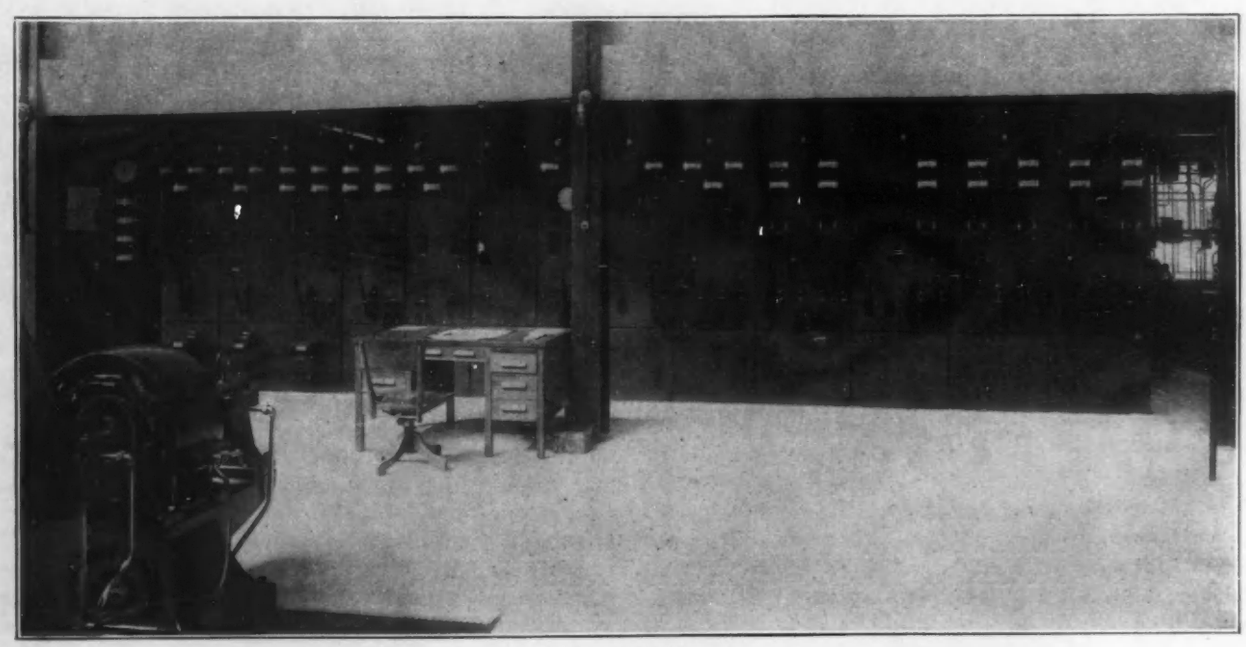
Alameda System of Street Lighting for Tree-Planted Streets.

of local design, and of a construction that is both simple and durable. It was recognized that for tree-planted residence streets it was necessary to so install the lamps that the maximum of street and sidewalk illumination would be secured without the foliage interfering to an appreciable extent and small units plentiful in number were considered as best to secure this result. An ordinance was passed which provides that all trees be trimmed 9 ft. above the curb so as not to interfere with the street lighting. It will be noticed from the illustration that the posts are lower than usual for that purpose. The effect is excellent. All wire and conduit for the street light system is underground and controlled from the plant.

The department of electricity also operates a store located in the business district for the sale of lamps and electrical appliances. The appliances are sold to consumers at a low price for the purpose of encouraging patrons of the plant in the further use of electrical current. Lamps are also handled so as to guarantee to customers a good lamp of proper voltage and at a reasonable price. The office staff and accounting department occupy commodious quarters in the city hall where all accounts and monthly statements of the operation of the plant are on file for inspection and examination by citizens and others interested. There is an ordinance governing the inspection of all electric wiring installed in the city, and all persons engaged in the business are required to pay a license fee and to register. The department has an inspection bureau, as the enforcement of this ordinance comes within its jurisdiction. The inspection is rigid, and insures the property owner against losses which might result through faulty work performed by unscrupulous wiring contractors.

The Alameda Municipal Electric Light Plant is under the control of a board of three commissioners of the Department of Electricity of the City of Alameda. The commissioners are appointed and receive no salary, but give their services as a duty of citizenship and a matter of civic pride.

The success of the Alameda Municipal Electric Light Plant is undoubtedly due to the advantage of having on the board of commissioners men who are by education and experience fully qualified for the work. The success of municipally owned public utilities hinges upon their being conducted along the same



The New Switchboard.

Street Lighting-Regulators.

lines as those of private ownership. Politics have no place in the operation of the Alameda Department of Electricity. Men are employed and retained on their merit, the superintendent of the department having entire charge of the hiring and discharge of all employees and highly efficient service is secured.

The plant is situated in an ideal location on the shore of San Francisco bay. There is a steadily increasing demand for power along the tidal canal and this is rapidly building up the day load. The increased demand for electrical appliances has also an important bearing upon increased consumption of current during the day time.

The power factor of the system during the evening load is 95 per cent, but in the day-time it drops to 72 per cent. The load factor is above 30 per cent and this is probably due to the large proportion of residence lighting business.

The overhead construction complies with the state law governing the same. All poles are 45 ft. long, 8 in. top diameter, round, and of cedar. There is an agreement with the telephone company by which the joint ownership of poles allows both companies to use them, thus reducing as far as practicable the number of poles upon the streets.

The population of the city is approximately 30.-000 and there are over 4000 meters installed. All service rendered and current sold, is charged for, including street lighting and public buildings.

Although all city lighting is charged at 2¼c per kw.-hr., the city is really getting its street lighting and more for nothing, as all profits from the operation of the plant are returned to the city treasury. No provision is therefore made for taxes for street and public building lighting purposes.

The department also has charge of the fire alarm system and the same men take care of it that are in the lighting plant service, which reduces the cost of maintenance to a minimum. A contract has just been let for the installation of a police flash-light system, with the Gamewell Fire Alarm Company, and this system will also be under the charge of the department of electricity. The cost of maintenance for these two systems is paid for by the police and fire departments.

Irrigation by Electric Power.—The Western States Gas and Electric Company, a Byllesby property, first made efforts to develop the use of electric power for irrigation purposes in the territory north of Stockton in February, 1912. In October, 1913, the company had connected 4652 h.p., in motors, all used for pumping water in the irrigated districts, the water being obtained from 30 to 50 ft. wells. By irrigating already fertile San Joaquin lands in this way, their productiveness is greatly increased. Samuel Kahn, general manager of the Stockton property, says: "We receive daily applications for electric power in the rural districts which come totally unsolicited, for every farmer who has power on his ranch acts as a new business agent for our company. The real estate companies which are subdividing tracts of land act as power salesmen for us also. I have in mind a firm which at the present time is selling 5 and 10 acre ranches, and with each ranch they give the purchaser a motor and a pump, and at the same time have him sign an application for power, which is mailed to us."

A NEW RATE MAKING BASIS.

BY MAX THELEN.

(In the absence of a definite Supreme Court decision as to the basis upon which public utility rates should be established the author argues in favor of a just and scientific method of making public utility rates with particular attention to land values. As part of a paper read before the annual convention of the National Association of Railway Commissioners at Washington, D. C., in October, 1913, this argument was preceded by citation of several cases showing the great difference between the "cost of reproduction" and "original cost" due to the unearned increment of land. The author is commissioner and attorney for the Railroad Commission of the State of California and his statements are worthy of the most careful consideration.—The Editor.)

The fundamental relationship existing between the public and its public utilities is that of principal and agent. Out of this relationship logically should grow the proper basis for determining the rates which a public utility is entitled to charge. The state has the right to do for the public whatever is demanded for the public welfare, including the establishment and operation of enterprises of a public utility character. What the state can do itself it has the right to delegate to private corporations and persons to do for it.

In carrying out the agency, the public has given to the public utilities the right to use the streets and highways and to take the property of private persons in the exercise of the power of eminent domain. These are tremendous powers which are conferred by the state only upon its agents in the prosecution of enterprises of a public or quasi-public character. In eminent domain proceedings the plaintiff must allege and prove that the use is a public use and that the plaintiff is in charge thereof. He can be in charge thereof only as the agent of the public to carry out powers exercised in behalf of the public as principal.

Now with regard to the bearing of this relationship on the problem of the proper basis for rate fixing. It is a well established principle in agency that an agent acting within the scope of his authority is entitled to be reimbursed for the money which he honestly and judiciously expends for the benefit and account of the principal, together with a proper compensation for his services. As a general rule, it is a breach of good faith and of loyalty to the principal for an agent to deal with the subject matter of the agency so as to make a profit out of it for himself in excess of his lawful compensation. If such profit is made, the agent may be held as a trustee and may be compelled to account to his principal for all profits and advantages acquired by him out of the relationship. If the agent acquires title to property in his own name as part of the agency, he will be deemed to hold this title for his principal. If A is the principal and B the agent, and A, for the purpose of enabling B to carry out the agency, deeds property to B, B cannot later contend that he can hold the property for himself. He holds it for his principal. Likewise, if B, in the course of his agency, acquires title to property from any source, and that property thereafter increases in value, he cannot lay claim to keep the increase for himself. In each of the above cases the agent holds the property for the principal and must account to the principal for it.

Applying these principles to the relationship between the public and the public utilities, it seems clear that the public utilities are entitled to a reasonable return upon such money as they honestly and wisely expend for the public, but that they should not be allowed a return on the increased value of the property used in the agency. If the agent has expended money dishonestly or has expended it injudiciously, he is not entitled to a return thereon. On the other hand, if he has acted honestly and wisely, and it thereafter becomes possible to acquire more cheaply property which he has purchased in the agency or to secure at a lesser expense labor or material used therein, the agent should not be compelled to suffer the loss but should be entitled to a return on the money honestly and wisely spent by him in pursuance of the agency.

This conclusion has been worked out by Justice Van Fleet in the water rate case of the San Diego Land & Town Company vs. National City (174 U. S. 739), logically and on principle from the fundamental relationship existing between the public and its public utilities. The use of the present value or the reproduction value theories does not spring in any way out of that relationship and has no necessary connection with it. As Justice Van Fleet clearly points out, the use of either the present value or the reproduction value theories may be as clearly unjust to the public utilities on the one hand, in case prices have gone down, as it is to the public on the other hand, in case values have gone up. In logic and justice, the public utility should receive a return on the money reasonably and properly expended in the acquisition and construction of its works actually and properly in use to carry out its agency—no more and no less.

A study of the decisions and of the trend of events shows clearly the cause of the adoption of the present value or the reproduction value theories. In the first cases which came before the courts, the utilities claimed a return on the amount of stocks and bonds outstanding or on the original cost, including large expenditures either dishonestly or unwisely incurred. The courts say clearly that it would be unfair to allow a return on such basis, and in looking for a way to avoid the unjust results which would follow therefrom, hit upon the present value and the reproduction value theories. But in doing so, the courts did not see that the application of these theories might with increasing values, particularly of land, result in an injustice to the public just as great as the injustice which would ensue in many cases if the amount of outstanding securities were used as the basis or if the original costs, swollen by dishonest or injudicious expenditures, were used. In seeking to avoid Scylla many of our courts have rushed into Charybdis. The time has come for a return to first principles.

Franklin K. Lane, whose ability on the Interstate Commerce Commission marks him as one of the great constructive statesmen of the age, clearly saw the danger which now confronts us.

In the Western Advance Rate Case (20 Interstate Commerce Commission Reports, 307), Mr. Commissioner Lane reaches the following conclusion as to the proper basis of fixing rates, with which conclusion I am heartily in accord:

The trend of the highest judicial opinion would indicate that we should accept neither the cost of reproduction, upon which the Burlington's estimate of value is made, nor the

capitalization which the Santa Fe accepts as approximate value, nor the prices of stocks and bonds in the market, nor yet the original investment alone, as the test of present value for purposes of rate regulation. Perhaps the nearest approximation to the fair standard is that of bona fide investment—the sacrifice made by the owners of the property—considering as part of the investment any shortage of return that there may be in the early years of the enterprise. Upon this, taking the life history of the road through a number of years, its promoters are entitled to a reasonable return. This, however, manifestly is limited; for a return should not be given upon wastefulness, mismanagement or poor judgment, and always there is present the restriction that no more than a reasonable rate shall be charged.

Mr. Lane's conclusion is based upon the fundamental relationship between the public and the utilities, it is accurate in theory; and it is just both to the utilities and to the public. In my opinion, it furnishes the best single basis for fixing rates and the basis to which attention should primarily be directed whenever the facts can be ascertained. Of course there will be cases in which modifications of this basis will have to be made. I am only seeking to ascertain the proper basis to use as a starting point in rate fixing inquiries.

Refutation of Objections.

It has been said that original cost, including betterments and additions, should not be used as a basis for utility rates, for the reason that it is often difficult to ascertain original cost. This objection goes not to the correctness of the principle but to the difficulty of applying it in a given case. It is true that in the eastern, and to some extent the middle western sections of this country, it is often impossible to ascertain the original cost of public utilities. In such case the courts and commissions should strive to ascertain as nearly as they can what the original cost reasonably should have been. A number of commissions in applying the reproduction test ascertain as nearly as possible what the work reasonably should have cost under the conditions under which it was actually performed. This test is practically the same as the test herein advocated. If it is impossible to ascertain the unit price and the conditions under which the work was originally performed, it may become necessary to ascertain reproduction value less depreciation as of the time when the rate inquiry is held. In doing so, it should be clearly borne in mind that this is being done not because reproduction less depreciation is the proper ultimate basis, but because it furnishes in the particular case the best available evidence of what the original cost reasonably should have been. If we bear this fact clearly in mind, we shall not rush into the dangers which ensue from the use of the present value or reproduction value test, without clearly understanding its significance. In California, the railroad commission has ascertained the original cost of right-of-way and terminal grounds of a considerable number of railroads, including all the land of the Western Pacific Railway. In other western and middle western states it will be possible to a considerable extent to ascertain the original cost, particularly of land.

It has frequently been urged that a public utility is entitled to a return upon the present value of its property or upon the reproduction value thereof, for the reason that it has title to the property, and it has been argued that a failure to give to a public utility a reasonable return upon the property to which it has title would be to confiscate its property in violation of the 14th Amendment to the Federal Constitution. This conclusion overlooks the relationship between the public and the utility and is based on the erroneous assumption that title is the basis of a fair return in public utility cases.

Referring to the first point, the Supreme Court, beginning with Mr. Justice Harlon, in the case of Smyth vs. Ames, has held that a utility is entitled to a return upon the fair value of the property, considering, however, all the circumstances. The most fundamental of these circumstances is the agency relation existing between the public and the utility. The utility takes its property subject to that relationship and can no more urge the plea of confiscation than can any other agent who acquires his property in the course of the agency and who is accountable to his principal for it. It would be just as logical for an agent who has acquired title to a piece of land in the course of his agency to claim confiscation if he is not allowed to keep the unearned increment for himself as it is for a public utility to make the same plea with reference to the property which it holds in its capacity as agent.

Referring now to the argument that title is the determining factor in ascertaining the proper basis for rates, it is evident that this view is erroneous. A public utility may, in the pursuit of its agency, spend large sums of money properly chargeable to capital account and entitled to be considered in rate fixing inquiries, and yet the utility may not secure title to the property represented by that money. For instance, a railway company may be put to considerable expense in paving streets, the title to which is in the public. Again, the company may build expensive structures in the public streets and may incur large expenditures for grade separations in the public streets. That the company is entitled to a return on the money so expended, even though it does not have title to the property acquired thereby, must be admitted by every fair-minded person. If it is just that the utility should be allowed a return in certain cases on money expended on property to which the utility does not secure title, it seems equally just that it should not be allowed a return on property to which it does have title, in excess of the amount to which, under its agency relation, it is fairly entitled. This thought is expressed by Whitton in Section 192 of his valuable work on "Valuation of Public Service Corporations," as follows:

Similarly if the government has given this same company the land for its right-of-way, the actual property in which the company has invested its capital and not that part to which it has title but which has been donated by the government should be considered in determining reasonable rates. Actual title and possession are not always conclusive. The determination of a reasonable rate is an equitable process and equity will demand that certain property to which the public has title should be included and certain other property to which the company has title should be excluded. It is the actual investment or sacrifice on the part of the company that is entitled to consideration regardless of mere title or possession.

The reason why a private citizen buying land is entitled to the unearned increment while a public utility acquiring land is not so entitled is that the citizen is performing no function of government and is not acting as an agent of the government, while the utility owes its entire existence and right to operate to the action of the state in conferring upon it certain of the powers of government, such as the right to use the streets and to take private property, to be used in the pursuance of its agency. The two cases are entirely different. To reach a conclusion in the one by an analogy to the other is extremely dangerous.

Commissioner Maltbie of the New York Public Service Commission of the First District, has clearly seen the difficulties arising out of appreciation of values and has tried to avert the danger by considering appreciation in value as income and balancing it against depreciation in other kinds of property. However meritorious this theory may be, the Appellate Division of the Supreme Court of New York, in the case of People ex rel. Kings County Lighting Company vs. Willcox, decided on May 9, 1913, refuses to adopt this view. While it seems clear that the result which Commissioner Maltbie desires to ascertain is correct, and that his theory, if adopted, would reach that result, I am of the opinion that the same result would be obtained more logically by starting with the basis herein explained than by starting with the cost of reproduction less depreciation basis. It seems to me wiser to return to first principles and to adopt a basis which springs logically and justly out of the fundamental relationship between the public and public utilities. If the courts fail to adopt this view, Commissioner Maltbie's theory appears to offer the only remaining hope.

In view of the tremendous importance of the problem and the uncertainty as to its ultimate solution, the policy to be pursued in the meantime by the various state railroad and public service commissions becomes a matter of serious consideration. I would suggest that in making physical valuations of utility properties and making their findings thereon, the commissions confine themselves to findings on questions of fact, and refrain wherever possible from finding as to the ultimate question of value. This is the policy pursued by the California Commission. The commission makes its findings on certain questions of fact, including the facts with reference to the organization and operation of the railroad, its stocks and bonds, its revenues and expenses, its original book cost, its reproduction value and its present value, by which latter term is not meant the ultimate fact of present value, but what may be termed the reproduction value less depreciation. The commission accumulates all these facts and makes its findings on them, but refuses to make a finding on the ultimate question of the value of the property. The value may be one sum for one purpose and another sum for another purpose. The correct value depends fundamentally both on the purpose for which it is to be ascertained and on the correct principle to be adopted in ascertaining it. Until the Supreme Court of the United States has clearly and unequivocally established the principle which it considers correct after its attention has been squarely drawn to the tremendous importance of the question of appreciation in value, I believe it would be far wiser for the commissions to adopt the policy which the California commission is at the present time pursuing. Whenever the correct principle is definitely established, it will be possible to refer to the findings of the commissions on the various branches of the question and from these findings to determine the ultimate fact of the value which is to be assigned to the property for rate making purposes. By exercising care with reference to these facts, and distinguishing clearly between a fact and a conclusion therefrom, the commissions will avoid the danger of putting themselves in a position from which they cannot withdraw and of adopting theories and making findings which will later come back to plague them.

I accordingly suggest that the various state commissions do all in their power to draw the attention of the courts to the dangers which confront them and to secure, if possible, the establishment of the principle herein contended for, which principle I believe to be correct in logic and in justice, and that in the meantime the commissions so do their work that they do not commit themselves in a way which will work increasing injustice to the public throughout the generations which are to come.

LETTER TO THE EDITOR.

(The letter reproduced herewith shows where one of our recent editorials struck a responsive chord in the East. The comment is appreciated. The name of Mr. V. R. Lansingh needs no introduction in the West. His book on "Practical Illumination" is read with profit by all interested in that subject. In connection with his efforts to better illumination and on account of the remarkable educational campaign carried on by the Holophane Company of which Mr. Lansingh is general manager, knowledge of his name and work is nation wide. Sufficient encouragement has been given us to assure the formation of at least one Section in the West.—The Editor.)

Cleveland, Ohio.

Dear Sir: I have been much interested in reading your editorial on the Illuminating Engineering Society in your issue of November 1, 1913. I was especially interested inasmuch as some years ago, as chairman of the New Sections Committee, I attempted to form a local section in San Francisco and also one in Los Angeles. One or two meetings of prominent engineers in these cities were held and the situation was thoroughly discussed. While the sentiment, as a whole, was in favor of forming such sections, it seemed unwise at that time to really start them until the propaganda of good illumination had spread somewhat further. I therefore was more than pleased with your editorial on this subject. Although I am not now chairman of the New Sections' Committee, I am going to take the liberty of calling your editorial to the attention of our president—Mr. C. O. Bond.

If, as the result of your editorial, you receive comments or letters on the subject, I am sure the Society would be most pleased to hear from you either one way or the other.

Very truly yours,

(Signed) V. R. LANSINGH,

Chairman Committee on Sustaining Membership,

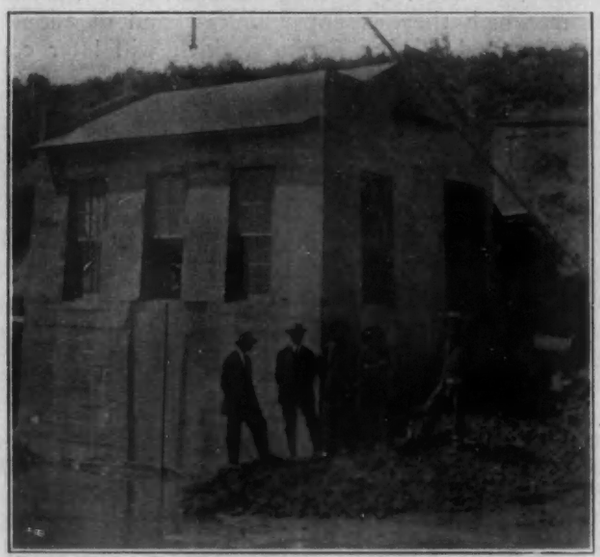
Illuminating Engineering Society.

HYDRAULICS V.

BY OTTO B. GOLDMAN

Irrigation System.

This subject naturally covers the design of (a) the pumping station, (b) the delivery and accessories and (c) the distribution of the water over the land being irrigated. In some cases "gravity" water is available. Whether to utilize this or obtain the water by pumping, is simply a matter of relative costs. If the interest on the difference in cost between a gravity system and a pumping system is equal to or greater than the cost of power, then the latter system is preferable. The maintenance of a long canal, is much



The O. W. Porter Pumping Plant in Eastern Oregon.

greater than a first class pumping plant. A long canal is a rather vulnerable piece of work, usually requiring much expensive repair work each spring. A gravity system, however, often tends to increase the number of pumping plants in a district, because there is usually more land above than below a ditch.

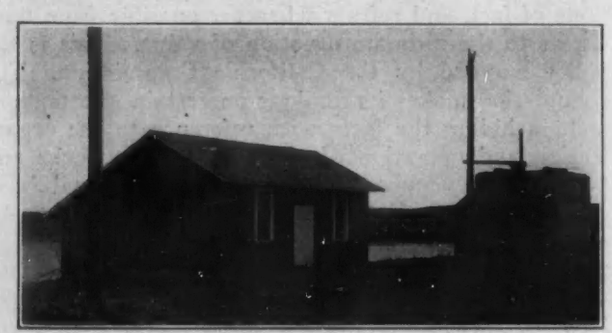
The source of water for most pumping plants of average or large capacity, is a stream. The best practice usually is to construct an intake at right angles to the stream, terminating in a sump, from which the water is pumped. The intake should be of large enough submerged section at extreme low water, to permit of the maximum inflow required, without appreciable loss of head. The sump must also be of sufficient depth to permit of the proper depth of submergence of the ends of the suction pipes, otherwise vortices will be formed, permitting air to be taken into the pumps. This will cause them to stop pumping altogether or worse still, permit them to continue at greatly reduced capacities and efficiencies.

Both the intake and sump should be lined sides and bottom with concrete to prevent erosion. The former should also be supplied with removable trash rack, and coarse and fine screens, placed in the order named from the stream. It is certainly not good practice to depend on a miniature screen fastened on the end of the suction pipe. The illustration of the Jason Halleck plant and still better the O. W. Porter plant show proper intake construction. Both plants are pumping from the Snake River near Weiser, Idaho.

It is perhaps needless to point out, that all machinery should be placed on concrete foundations. These should be of sufficient depth to prevent displacement, and of sufficient weight to absorb all vibrations. This holds just as true for small, as for large plants.

The Jason Hallack Plant Near Weiser, Idaho.

The housing for the machinery should be of fireproof construction. To put expensive machinery, upon which the entire crops of the land being served depends into a fire trap is bad practice and is being discarded. This type of construction is illustrated by the half-tone of the Sunnyside Orchard Company's plant and of the Weiser Flat Pipe Line Company's plant.



The Sunnyside Orchard Company's Plant.

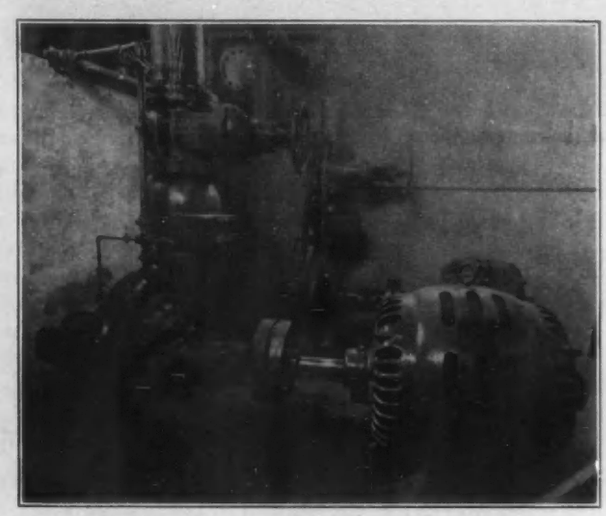
The building should be well supplied with windows, not only for light, but for ventilation. Whatever the motive power, a certain amount of heat is always liberated, which must be carried away, especially during the summer. This can easily be done where windows can be opened on opposite sides of the building and in the general direction of the prevailing air current. The latter two figures again illustrate building construction with improper ventilation

while that of the Porter plant, that of perfect ventilation.

In the very great majority of plants, electricity is employed as the motive power. This is not only due to the greater simplicity and ease of operation of a motor, but because the latter can be direct-connected

Exterior of the Weiser Flat Pipe Line Company, Weiser, Idaho.

to the pumps, at comparatively small additional cost and really at a saving, when we take into consideration the cost of the building, because of the much smaller building required by direct-connected units as compared with belt-driven outfits. This is well shown by the accompanying illustration. The Crystal District plant in Oregon and that of the splendid Snow-Moody near Payette, Idaho, both show the compactness of direct connected units. From the interior of the Weiser Flat Pipe Line Company's Plant before



Crystal District Plant in Eastern Oregon.

it was remodeled the large floor space required by these units should be noted as well as the poor ventilation provided. In the new plant, this has been changed and the pumps direct connected. An additional unit has also been provided. Practically all irrigation pumps are of the centrifugal or turbine type, because of their simplicity and long life. They have very few moving parts. A well-constructed pump of this type will maintain nearly its initial efficiency after many years of hard service. Relative to the choice of the pump, it must be remembered that this is one of the smallest items of cost in an irrigation system, but the most important, upon its efficiency and continuity of operation depends the success of the entire system. A cheap pump represents no more of an investment than a bet at the race track. Not only should we look to the guarantee of initial efficiency, but should also note whether the construction is such that this efficiency can be reasonably well maintained;

The Snow Moody Plant at Payette, Idaho.

whether it is such as to insure continuity of operation and whether the pump has desirable operating characteristics.

The most important parts of good pump construction are:

(1) The use of the enclosed runner, hydraulically balanced against end thrust;

Interior of the Weiser Flat Pipe Line Company's Plant Before Remodeling.

(2) Bearings on both sided of the runner, instead of having this overhung.

(3) Accessibility to the runner without disturbing suction or discharge piping;

(4) The use of the non-overloading type runner in direct-connected units;

(5) The use of water-sealed stuffing glands;

(6) Bearings of the external, ring oiling type;

(7) The use of flexible coupling between motor and pump in direct connected units.

The second and third parts of this general subject will be taken up in a further article.

THE BROADWAY BRIDGE, PORTLAND, ORE.

BY F. D. WEBER.

Construction.

There is now in successful operation in Portland, Ore., the largest "Rall Bascule Span" ever erected, and the details of the general construction and equipment should prove of considerable interest. This bridge cost $1,600,000, and its estimated life is 100 years. The length, from the west approach to the east, is 2150 ft. There was used 7800 ton of steel in its construction, and the height above low water is 92 ft. The height of the bascule leafs, above bridge deck, when raised, is 175 ft. The width of bascule leafs is 250 ft. in the clear. The grade of the west approach is 3.8, and that of the anchor spans and base 2.25. The width of the roadway is 46.5 ft. and over all 70 ft. The counter weights contain 570 yd. of concrete in each, there being two in number, one for each leaf, and each leaf contains 950 ton of steel. The decking is paved with creosoted wood paving blocks, with Schuman pavement on the bascules.

Portland, Oregon, Broadway Bridge—Rall Bascule Open.

The bascules are operated electrically with 600-volt motors, the energy for which is secured from the Portland Railway, Light and Power Company's street car trolley system. The west bascule can be operated from the west side of the river, the east bascule from the east side of the river, and both bascules from the west side of the river. The two sides of the bridge are connected under the river channel by submarine cables, but are fed from different and independent substations.

The operating equipment was furnished by the General Electric Company. The motor equipment for the east lock consists of one 5 h.p., 400 r.p.m., 600 volt, d.c. series wound motor, with disc brake, and one drum type controller with resistance.

The main motor equipment consists of four 75 h.p., 650 r.p.m., 600 volt, series wound back geared motors, back gear ratio 58/19, each equipped with solenoid brakes and controllers with resistances. Two emergency air brake equipments, each consisting of one air compressor 600 volt. (25 cu. ft. per minute piston displacement.) One MC Form B governor, safety valve and 16x48 in. reservoir. The switchboard was furnished by the Westinghouse Electric & Manufacturing Company.

The weight of the machinery used to operate this bridge is 100 ton. The bascules are each operated by two 75 h.p., 650 r.p.m. series wound back geared motors, each equipped with solenoid brakes. These are directly geared to a shaft to which is attached a large wheel, which in turn engages a straight operating strut with teeth on the under side, and these engage the geared wheel. Consequently the bascule is virtually pulled and pushed up and down on the anchor pier, on which all the machinery is located and properly housed. The bascule rolls on a 100 in. nickel chrome steel roller, 40 in. face. The locks are operated by motors and the brakes by compressed air.

The equipment is in duplicate, as regards motor equipment, so that if one motor should burn up there would still be sufficient capacity to operate the leafs.

This bridge is of the highest class of workmanship known for highway bridges. It has been built to withstand the heaviest traffic that it could reasonably be expected to carry. The sidewalks, of concrete, are designed to sustain 100 lb. per sq. ft., and two ordinary railroad freight trains could cross it at the same time without straining it in the least, but not the concentrated weight of the heaviest locomotives. The floor and girder spans are designed to bear a load of 51½ ton cars crowded with people on each of its two tracks. The roadway on each side of the tracks are built to carry 24 ton steel or machinery trucks and the remaining surface of the roadway to hold a weight of 100 lb. per sq. ft.

The peculiar feature of the Rall type is the huge steel roller on which the bascule rolls back on the steel track, supported by the anchor span, in opening and closing. This feature made it necessary to design a special method of crossing these bascules with the two trolleys, and this problem was satisfactorily worked out by the Portland Railway, Light and Power Company. In passing, it should be noted that there are

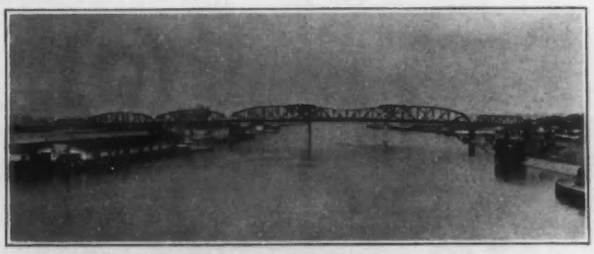
four distinct rotary motions, one about a stationary center, and the others about movable centers.

The City Engineering Department of Portland designed a special trolley pole for use on this bridge, and the only fault that has developed so far, is the fact that they have pulled loose, in two instances, from the bridge decking, but the poles themselves have not failed in any way.

The 600 volt trolley current is used for the signal lights of the bridge and a special resistance is employed with them.

The designing engineer of this bridge was Mr. Ralph Modjeski, consulting engineer, New York.

The Strobel Steel Construction Company of Chicago, Ill., designed all the steel work and the Pennsylvania Steel Company of Steelton, Pa., took care of the erection.



Broadway Bridge—Rall Bascule Closed.

Bridge Lighting.

BY F. H. MURPHY.

The question of suitable bridge lighting has been given considerable attention by the City of Portland, and within the past two years the five steel bridges spanning the Willamette River, as well as a number of smaller bridges in various parts of the city, have been equipped with a system of boulevard post and bracket lighting. Such a system serves its purpose admirably, for not only is it an excellent means for facilitating traffic across the bridges, and a great aid in properly policing them, but it is artistic as well, presenting a very pleasing and attractive appearance either when crossing the bridge or when viewing it from the distance.

In addition to the regular boulevard lighting of these bridges, four of the five crossing the Willamette have been provided with a permanent decorative lighting system also. The one exception is the Harriman double deck bridge, which was completed about two years ago, and the upper deck of which is rented to the city. This, however, has a regular boulevard lighting system for the upper deck, which harmonizes with those installed upon the other bridges. The decorative lighting is used only on special occasions, when the city wishes to celebrate some important event, such as the Rose Festival or a big convention. Since every year brings such events, the inconvenience and expense of installing temporary lights for this purpose became a considerable burden, and it appeared that if lighting of this nature was desirable it would be much better to make it of a permanent nature, thus reducing to a minimum the cost of such decorative advertising, and at the same time having a system available at any time. The result of such a permanent system is far superior to anything that could be produced by loose festoons of light, and so also is the advertising value of such displays. The effect of those thousands of small lamps outlining the principal members of the big steel bridges and transforming the harbor into a beautiful fairyland is magnificent, and it produces a lasting and pleasing impression upon every one who sees it. This, by the way, is good advertising, too.

The last of these bridges to be completed was the Broadway, a magnificent steel bridge with the Rall-Bascule type of draw. This bridge connects Broadway on the east side with the new Broadway (formerly West Seventh street) on the west side. It spans the river with a clearance over the main channel of 85 ft. above high water, and has a draw opening of 278 ft.

In installing the lighting system 19 miles of rubber-covered wire, ranging in size from No. 14, B. & S. gauge to 1,000,000 c.m., were used, 20,000 ft. of galvanized conduit, from ½ in. to 4 in., about 7000 Types RT and RK condulets, 136 2-light brackets, 43 Type B 5 light boulevard posts, 444 100 watt Mazda tungsten lamps, 43 60 watt Mazda tungstens, and about 7000 4 c.p carbon lamps. These figures do not include the navigation and operating lights, which represent a connected load of about 6 kw. The total connected lighting load for the bridge amounts to approximately 200 kw., and the connected power load to about 235 kw.

The service for the bridge is supplied by means of three 50 kw. transformers, one located at the east end of the bridge and the other two on the west side of the river midway between the second and third span of the bridge (numbering from the west end). These transformers are mounted on the bridge structure below the bridge floor, and transform directly from the Portland Railway, Light & Power Company's 10,000 volt lines to a 3-wire, 120/240 volt distribution service. This service in either case passes through an automatic oil switch and into a steel distributing cabinet located above the sidewalk level. The three wire system of distribution is used throughout the installation.

From the cabinet on the west side of the bridge, nine sets of 3-wire feeders are taken. There are four principal feeders, two running east and two running west, one for either side of the bridge in each case, which carry the majority of the post and bracket lights and all of the outline lights for that portion of the bridge west of the center of the draw span. Accompanying each of these feeders is a smaller one which supplies the "Owl" posts and brackets only, and the ninth feeder is carried east to the operating house and supplies the lights for the operating and machine houses as well as the general signal lights and some of the navigation lights. As an emergency precaution these lights are so connected that they may be cut over through a set of resistances on to the 500 volt power service in the event of a breakdown to the regular lighting service.

The feeder system on the East Side is handled in a similar manner.

The "Owl lights" referred to in this article are the posts and bracket groups that burn all night, the

balance of the lighting is cut out at midnight. Every fourth post or bracket group on either side of the bridge was selected for all night burning and these "Owl lights" were so chosen that they are staggered in their relation to each other across the roadway. This gives a very satisfactory and uniform light for the latter part of the night also.

The decorative lighting circuits are controlled by switches in the switch cabinets located beneath the bracket fixture in each case.

The bridge operators' houses are heated by means of electric radiators.

On the west approach, there are thirty-one, type B, 5-light, boulevard posts placed opposite each other and spaced about sixty-five feet part. On the East approach, twelve of the same type of boulevard posts are used and they are located in the same way.

On the bridge itself, 2-light bracket fixtures of a design to harmonize with the boulevard posts are used. These brackets are mounted in pairs upon the principal vertical members of the bridge, one on the roadway and the other on the sidewalk side of the steel member. These groups of four lights are placed opposite each other across the bridge and spaced about fifty feet apart. The distance from the road way to the center of the globes is eleven feet which is the same as the mounting height of the bracket lights on the posts.

All the bracket arms both on the bridge structure and on the boulevard posts are equipped with 100 watt Mazda lamps enclosed in 12 in. C. R. I. globes, and the tops of the posts are equipped with 60 watt Mazdas enclosed in 16 in. C. R. I globes.

In order to reduce to a minimum the effects of bridge vibration, a simple shock absorber was designed and used throughout the installation. This consists of a strip of fibre which is wedged into the iron bell of each bracket arm. To this is attached a coiled brass spring which in turn is soldered to a weatherproof socket. This forms an inexpensive shock absorber which holds the lamp centered in the globe and works equally well under compression or tension.

Provision is made also for protecting the globes against this vibration. A spring brass collar rolled to conform to the curvature of the neck of the globe is used to provide a support all about the globe. At equal distance about this collar, four one-inch lengths of heavy rubber tubing are placed, and these pieces of tubing receive directly the set screws of the post of bracket bells.

The decorative lighting of the bridge is accomplished by means of 4 c.p. carbon lamps spaced 18 in. apart. These lights are distributed along the upper and lower chords and the principal vertical members of the bridge. The line running down each vertical member terminates in a bracket fixture in each case. A new class of condulet, types R J and R K are used throughout the installation for the outline work.

The two sections of the draw span rise through a 90 degree angle and for this reason the bracket lights required special treatment as it was evident that neither the globes nor the lamps could stand the shifting from vertical to horizontal and back again with the resultant vibration due to the operation of the bridge. This difficulty was overcome by a slight change in the design of the 2-arm bracket fixture used throughout the bridge. The usual back plate was omitted and the head of the bracket drilled so as to receive a 1¼ in. pin mounted horizontally upon the vertical member of the bridge on which the bracket would otherwise have been mounted directly. This leaves the bracket unit free to swing through a vertical plane and the center of gravity of the unit is so located that the lights always maintain the same upright position regardless of the position of the draw span. This has proved entirely satisfactory during the five months that the bridge has been in service.

In order that the effects of temperature conditions might be provided for, a number of expansion joints were placed in the long conduit runs. These are especially necessary at the points where the expansion joints for the bridge structure are located and may be very desirable at other places in long runs.

Another problem met and solved in a very satisfactory manner in this case was the matter of carrying the feeders from the anchor spans onto the draw spans. On the other bridges, the connection is made through knife blade or wiping contacts, and as soon as the draw begins to open all the ights on the draw span are extinguished. This is not desirable, or to have the circuit broken so frequently, and furthermore the best of contact switches operating under such conditions are liable to become sources of frequent trouble. It was therefore deemed advisable to use some other means of carrying the feeders on to the draw spans. The feeder conduit on both anchor and draw spans was carried up the bridge structure about twenty-five or thirty feet above the floor of the bridge to points on each span which had the least relative motion with respect to one another and there terminated in iron boxes. A flexible armored cable, carrying three flexible stranded conductors of just sufficient size to meet the Underwriters' requirements for current carrying capacity, is dropped in a long loop from the bottom of one of these boxes to the bottom of the other one. Each feeder is handled in the same manner. Very little relative movement occurs in this cable loop during the operation of the bridge and very little if and trouble is likely to be experienced for years to come.

San Diego's $10,000 electric signboard will be 48 feet high and will be located on the roof of the Josse Building. It will cost $10,000, and is said will be the largest electric sign in Southern California. The sign will contain 32,000 lamps. Across the top in large letters will appear the slogan: "San Diego, First port of Call." The lower half of the sign will be devoted to revolving electric signs of business firms. Current will be furnished by the San Diego Consolidated Gas and Electric Company.

Nearly every residence connected.—Ninety-eight per cent of the residences at Victoria, B. C., are connected up to the lighting company's system. The city has a population of 60,000 and 10,000 lighting meters are in use.

ENGINEERS' CLUB HOUSE WARMING.

Members of the Engineers' Club of San Francisco celebrated their advent into their new club rooms in the Hotel Sutter by a house-warming on Saturday night, November 15th. About one hundred engineers sat down to dinner at 7 p. m. and later enjoyed a humorous take-off on local engineering accomplishments. A full appreciation can be had only by acquaintance with the participants.

The entertainment committee had provided a program along the lines of the famous Gridiron Club of New York. The personnel of the committee, W. W. Briggs as chief instigator ably abetted by Geo. R. Murphy, K. G. Dunn, C. T. Hutchinson and P. R. Bradley, is sufficient evidence of the high grade of fun-making.

A wonderful question box gave the most astounding answers to various propounders. "Who put the bolt in the Jupiter's turbine?" "Jerry done it." "What is a mining engineer?" "A man out of a job." "What is the difference between a telephone engineer and a golf player?" "A. H. Griswold." "What kind of hair does Struble wear on his head?" "A Union Switch." "What is the most interesting surgical operation known to the engineering profession?" "Pierson Roeding." "Who put the gin in engine?" "The bartender."

Briggs, "that notoriously nervy guy," that unveiled the "Farinheight Oxymometer," a weird instrument that the fellow conspirators had designed and carefully calibrated to indicate the height of endeavor reached by the contestants in the bouts that followed.

First was a thrilling drilling contest between two teams of miners. One tipped the scales at 248 lb. bedside, the others being feather weights and perhaps minors. In three minutes the tiny rubber hammers drove the drills through 18¼ and 18½ inches of bruised hands respectively, Judge E. H. Benjamin awarded the potassium permanganate prize to the losers.

Then an investigation of inductive interference was held under the authority of a medical clinic consisting of A. M. Hunt, Frank Varney and E. H. Benjamin, "D.D.S." A. H. Griswold, representing the "Pacific Line out of Order," brought grave charges of interference (which means a striking of the fetlock with the other hoof and is thus a form of kicking) against the Pacific Graft & Easy Mark Co. as represented and ably defended by S. J. Lisberger.

G. A. Williams, "an economic and wasteful geologist," next brought in an oil-well with the assistance of several insulting engineers. The climax was reached when the hole was dynamited and the gusher hit the ceiling.

The entertainment was brought to a close by A. H. Babcock, "the white-hope of the Tehachapi Pass," who again demonstrated why it could not be done.

Engineers' Club Dinner.

The club plans quarterly frivolities of this character which do much to bring the membership into closer contact. The headquarters are now open and latch keys are ready for all members. C. W. Merrill is president and H. F. Bain secretary.

ELECTRICAL COOKING AT VICTORIA, B. C.

Electric cooking is finding much favor among customers and at the present time some 300 installations are in operation, giving entire satisfaction. The B. C. Electric Company gives a special rate of 5c per kw.-hr. for heating and cooking business, subject to a monthly minimum charge of 75c per connected kw.; at this rate there has been no complaint, and this end of the company's business is steadily increasing, the average during the past six months being three ranges per week. One installation, which has proved to be of more than ordinary advertising worth, was a complete electrical installation in one of the local schools, in the Household Science Department. Parents of the girls have an opportunity to visit the classes at any time to note progress made, and the electrical equipment has invariably come in for special attention.

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Public Utility Valuation

Public utility valuation is in a chaotic state. The subject is so new that its principles have not yet been definitely formulated. New conditions are constantly arising for which no precedent has been established. Legal decisions lag so far behind engineering progress that many of the underlying theories have not been universally accepted. A new science is in process of evolution.

The most fundamental of these questions, the proper basis upon which rates should be calculated, is now in controversy. Valuation experts may be classified into two schools, those who favor the "original cost" method and those advocating the "present cost," or "reproduction cost" theory. These terms are so nearly self-explanatory as to require no further comment.

Elsewhere in these columns is a strong argument in favor of the former method, it being stated that if the reproduction value theories are carried to their logical conclusion rates will soon become so high that nobody can pay them. The utility corporation is considered as an agent supplying certain needs for the public as a principal. Such agent is entitled to a reasonable return upon money honestly and wisely expended for the principal but should not be allowed a return on the increased value of property used in the agency. Much of the difference between the comparative values reached by these two methods is due to the unearned increment of land worth. The agent has done nothing to earn this increase, consequently the principal should not be asked to pay rates on it.

This view point is in accord with the suggestion which has been previously developed in these pages that the supply of a utility is a public function, not a private business. Its public quality is paramount to private profit. The corporation, as a contractor for the performance of a public service, should place satisfactoriness of service above all else.

Failure to recognize the foregoing facts is the chief reason that many corporations are now being called upon to meet the competition of municipal plants. One of the latter, belonging to Alameda, California, as described in this issue, shows an economy of operation which many a private plant might envy. That more municipal plants do not make similar showings is due only to the inefficiency of political operation. That many privately-operated plants exceed it is an argument in favor of private operation of municipally owned plants. This leasing plan has proven economical and practical in the operation of the Philadelphia gas works after the people became disgusted with political operation, as well as in the Boston and New York subways where the corporation had previously been the party at fault.

Recognition of their public character will do much to protect corporations against competition. It seems to be a consensus of expert opinion that the public is best served by a regulated monopoly. But before the people can be educated to this thought it is necessary for the corporation to show the right spirit. Greed makes a poor creed. The handwriting is on the wall so plainly that he who runs may read.

Business is Good

Views to the contrary notwithstanding, business in the electrical world is good, as shown by the wonderful growth and excellent financial reports. A tacit acquiescence with other's views is often responsible for erroneous conclusions. This is especially true when those views compass either grouch or complaint, and they work havoc to the extent that they are entertained in thought.

Individual action depends upon our opinions hence the importance of forming our own instead of being stampeded through a tacit acceptance of those of others.

We should appreciate the product of our own small plot rather than revel in the weed-choked acres of our neighbors.

Sometimes big business which depends for expensive though necessary extensions upon ability to attract outside capital, feels the pinch because that capital is withheld, but it is only in degree that a lack felt by big business influences business in general.

It would not be reasonable to ignore the world-wide money stringency but in any locality where crops are good and a fair market obtains, where industries are active, or where there is a large influx of better class immigration, that stringency should not exercise a serious influence.

Time was when business was compelled to grow from within and such growth being healthy, the pendulum's swing may yet again find that condition desirable. The use and highest development of that we already have makes possible a natural growth and easy.

Yet business is good. It is unrest occasioned by ill-advised comment and complaint which is undesirable and causes uncertainty. Unrest, it is well to remember is but a negative condition which may be readily dispersed, just as the negative condition of darkness is dispersed at the coming of light. Let us let in the light, flood the country with encouragement, and consign the inelegant grouch to the limbo of our discontent.

One way to undo the effect of unrest and so restore confidence is to be silent about our belief in the bad and boost wherever possible the measure of good which does and always will obtain.

We are ever anxious for improvement. "It might be better," is habitual. The more we have the more we want and soon we find we have more than we want and either sigh for slack times or focus upon a vacation.

Business is good when we have neither too much nor too little, and he would be indeed a clever judge who could adjust the balance—so let us plow right on though an unceasing pessimism, more or less habitual, predict failure.

It is not customary to make the sale and then advertise, but to advertise that sales may result. Similarly the autumn and winter seasons of business are not those in which we should bestir ourselves because of business gained throughout the past summer, but seasons in which we work preparing the ground for the spring showers and the rich summer harvest.

Let us quit kicking and indulging the inelegant and cultivate instead the inspirational effort back of the slogan "Business is Good!"

Factory Lighting Important

In several western states overtime work in the factory is practically prohibited. But the proper artificial illumination, or factory lighting as it has come to be called, is of as great importance as though such limitations did not exist. In winter-time darkness falls so early that it encroaches upon regular working hours. Night is a trespasser upon the workman's day. Dark corners must be lighted even when daylight is sufficient elsewhere, and again, there are occupations which must be performed at night. The consideration of proper factory lighting cannot be shelved.

In the state of California alone, industrial accidents average over fifty per day and on an average more than one of these results fatally. This includes accidents which occur outside of factories except agricultural. It is estimated that the number of accidents which occur within factories is more than 40 per cent greater during the winter months than the summer. That sufficient, suitable and therefore satisfactory lighting will do much towards decreasing this difference has been amply evidenced in practice. Good lighting is good accident insurance.

Business considerations demand good factory lighting no less than the humanitarian, for with proper lighting it is possible to increase output, improve the grade of the goods manufactured, and decrease the losses occasioned through spoilage. The cost of improved lighting is inconsiderable as compared with these advantages and gains. Improved lighting usually results in economies of current consumption which are astounding.

Change of pace with the waning day was once accepted as but natural. Efficiency of factory operation called for an investigation and it was found that this falling off was due to fatigue. Experiment has proved that the fatigue was due to causes, many of which could be eliminated. One of these was poor lighting and this was one of the easiest and cheapest to remedy for not only were the appliances available, but factory lighting was found to cost but a small fraction of the value of the workman's time. It naturally follows that the employer who fails to provide satisfactory factory lighting is not only guilty of gross negligence in failing to provide known safeguards for reducing the possibility of accident, but is also allowing operating expense leakages which will eventually imperil profits.

Good factory lighting is indeed important.

It should not be necessary to legislate good lighting into our western factories and would not be if we each did our part. A progressiveness in evidence everywhere else here seems temporarily halted. What is the cause? In the electrical business we are apt to agree too readily to instructions given by those who are paying for the work, but who often do not really known what is best for their needs. Here co-operative effort should exist between the electrical contractors and the lighting specialist. To serve the factory and the community in this way is an opportunity which electrical contractors, jobbers, central stations, engineers and lighting experts should certainly grasp.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Wynn Meredith, Pacific Coast engineer with Sanderson & Porter, is at Vancouver, B. C.

A. V. Olson, representing Pass & Seymour, was at Spokane, Wash., during the past week.

R. S. Masson, consulting engineer at Los Angeles, visited San Francisco during the past week.

C. V. Schneider, electrical contractor, Sacramento, spent the first part of the week in San Francisco.

E. L. Haines, secretary and vice-president National X-ray Reflector Company, Chicago, is at San Francisco.

H. C. Rice, vice-president General Incandescent Lamp Works of General Electric Company, is at San Francisco.

S. B. Anderson, district manager San Francisco office, Pacific States Electric Company, visited the Seattle office last week.

E. A. Taylor is now with the Pacific Light and Power Company of Los Angeles, as commercial business representative.

Geo. Campbell, manager Stone & Webster interests near Reno, Nevada, and Mrs. Webster, were recent visitors at San Francisco.

H. L. Clark, representative of Westinghouse-Church-Kerr Company, San Francisco, returned recently from an extended trip throughout the East.

R. H. Sperling, general manager, B. C. Electric Railway Company, left Vancouver, B. C., for the East and will be away several weeks.

John Coffee Hays, president of the Mt. Whitney Electric Light and Power Company, Visalia, Cal., was at San Francisco during the past week.

F. H. Leggett, Pacific Coast district manager Western Electric Company, San Francisco, spent a few days recently visiting the Seattle section.

Andrew McPherson, has been appointed superintendent of the Southern Pacific Company's electrical system of the cities east of San Francisco Bay.

L. Kahn, vice-president and general manager Western States Electric Company, Stockton, was at San Francisco during the latter part of last week.

Henry M. Richards, of Spokane, a director of the Washington Water Power Company, was seriously injured in a runaway accident near Springdale, Wash.

G. I. Kinney, Pacific Coast manager of the Fort Wayne Electric and Sprague Electric Works of the General Electric Company, is visiting the Eastern factories.

J. A. MacMonies is back at San Francisco, having completed a business trip which very thoroughly covered the important cities in the central states and Canada.

Col. H. V. Carter, president Pacific States Electric Company, returned to San Francisco the latter part of last week from a trip through the northern part of California.

H. F. Holland, intermountain representative of the Simplex Electric Heating Company, has returned from an extended trip and vacation to the home office and factory at Boston.

P. D. Callahan, representing the Faries Manufacturing Company, Decatur, Ill., was in San Francisco last week and has left for the south, where he expects to remain for some time on company business.

C. N. McCallum, mechanical engineer, formerly chief designer in the engineering department of the Seattle Construction & Drydock Company, Seattle, has opened offices at 422 Mutual Life Building, Seattle, Wash.

Lee Shubert, president Colorado Electric Club, was a visitor at the Utah Electric Club luncheon Thursday and reported the rapid strides made by his club in the last few months. They now have a membership of 950.

C. T. Hutchinson, E. C. Jones, Thomas Morrin, Robert Sibley and **C. R. Weymouth** have been elected members of the executive committee of the San Francisco branch of the American Society of Mechanical Engineers.

James Colkitt, representative of John A. Roebling Sons Company, has been appointed Statesman of the Jovian Order at Los Angeles, Cal., and **T. E. Burger,** manager of the Western Electric Company, has been appointed alternate.

H. B. Lynch has been appointed superintendent of the proposed lighting plant at Burbank, Cal. He formerly was manager of the Glendale Lighting Company, and was at one time connected with the General Electric Company.

E. B. Criddle has been appointed acting general agent of the Southern Sierras Power Company at Riverside, Cal. **Fred B. Meckling,** formerly general agent at Riverside, has been placed in charge of the Nevada-California Power Company's Goldfield office.

Le Grand Brown, consulting engineer, has opened an office at 1307 Claus Spreckels Building, San Francisco, having been previously in another part of the same building. Mr. Brown, in addition to civil and electrical engineering, also specializes upon valuation work.

L. L. Nunn, president of the Idaho Power & Light Company, was at Boise, Idaho, last week in conference with **Mr. Bacon,** general manager, **H. W. Sanders** of Los Angeles and **Mr. Crane** of the Idaho Railway Company, in connection with the Swan Falls power plant.

B. C. Condit, chief engineer Northwestern Electric Company, Portland, Ore.; **John B. Fisken,** superintendent of light and power, Washington Water Power Company, Spokane, Wash., and **F. W. Harris,** consulting engineer, Los Angeles, Cal., have been transferred to the grade of Fellow in the American Institute of Electrical Engineers.

T. Miyaguchi, consulting engineer with the Nippon Electric Light Company, Lagami Hydroelectric Company and the Yokohama Electric Railway Company of Yokohama is a visitor at San Francisco. Mr. Miyaguchi is returning to Japan, having nearly completed a tour of inspection of the principal electrical manufacturing and generating plants in Europe and America.

Philip Dodd, "our Phil" of the electrical fraternity, has returned once more to the fold. Starting in the electrical field as manager of the "Electrical Review," the next step director of publicity of the National Electric Lamp Association, filling the secretaryship of several auxiliary branches of the association, recently connected with the Society for Electrical Development, he has now allied himself with the Tucker Agency, Inc., New York City. Mr. Dodd's work with the agency will be the organization of a special department for central station advertising service. Phil has a world of friends, who all wish him success.

F. J. Bates, Los Angeles Aqueduct Power Bureau, Surrey, Cal.; **J. Beane,** electrical superintendent U. S. Reclamation Service, Tahonton, Nev.; **C. S. Bennett,** construction foreman General Electric Company, San Francisco, Cal.; **L. M. Bockoven,** telephone engineer, Pacific Telephone & Telegraph Company, Los Angeles, Cal.; **H. T. Bonfield,** consulting engineer, Seattle, Wash.; **M. G. Brown,** president Northern Telephone & Power Company, Ltd., South Fort George, B. C.; **R. A. Brown,** chief engineer and general manager Calgary Lighting Department, Calgary, Alberta, Can.; **J. W. Cook,** chief inspector Vancouver Electrical Development, Van-

couver, B. C.; **S. Carnborough,** construction foreman C. C. Moore & Company, Kamloops, B. C.; **H. V. Mooney,** Heald's Engineering School, San Francisco, Cal.; **W. S. Oswald,** city electrician's office, Vancouver, B. C.; **F. Romig,** U. S. Electrical Manufacturing Company, Los Angeles, Cal.; **H. B. Summers,** 1336 West 49th street, Los Angeles, Cal.; **F. Tappan,** power recorder, B. C. Electric Railway Company, Vancouver B. C.; **W. J. Taylor,** ass'tant superintendent powerhouse B. C. Electric Railway Company, Lake Buntzen, B. C.; **H. P. Thomas,** city electrical engineer, Nelson, B. C., and **J. S. H. Wurtele,** consulting electrical engineer, Vancouver, B. C., have been elected associate members of the American Institute of Electrical Engineers.

MEETING NOTICES.

Electrical Development and Jovian League—San Francisco.

At the regular weekly meeting held last Tuesday at Tait's Cafe a paper by Mr. J. C. Collins, on Electrical Co-operation was read and discussed.

Los Angeles Section, A. I. E. E.

Mr. J. H. Montgomery will present a paper before the Los Angeles Section of the American Institute of Electrical Engineers, on Monday evening, November 24th, at Blanchard Hall. His subject will be "Electricity and the Fire Hazard." The December meeting will take the form of a popular demonstration of household electrical devices by Max Lowenthal. The ladies will be invited.

Jovian League—Spokane.

The regular weekly meeting of the Jovian League was held at Davenport's on November 11th, about thirty members being present. A short though enjoyable talk was given by Mr. Lane of the Home Telephone Company about his experiences when he first broke into the telephone game, which was in the very early period of development, M. C. Osborne, contract agent, Washington Water Power Company, spoke regarding his company's plans in connection with the sale of electrical appliances, of which the company intend handling a full line in the near future. The meeting was thoroughly enjoyed by all.

Utah Electric Club.

At the regular weekly luncheon of the Utah Electric Club held at the Commercial Club last Thursday, Professor Levi Edgar Young of the University of Utah delivered a talk on the History of Utah. Professor Young devoted himself mainly to the industrial history of Utah and the part which electricity has played in it. He pointed out that the pioneers of this state, in their speaking and writing, frequently referred to the fact that they anticipated that the numerous mountain streams would be harnessed and utilized for driving the various industries necessary in a prosperous commonwealth. Little did they realize, however, that electricity would be used as a medium to transmit this power hundreds of miles from the point at which it was generated.

NEWS OF THE CALIFORNIA RAILROAD COMMISSION.

The railroad commission rendered a decision granting authority to the Coast Valleys Gas & Electric Company to issue $114,000 of bonds.

The Campbell Water Company was granted authority to issue 19 shares of stock of the par value of $25 per share to replace stock illegally issued.

A decision was rendered granting authority to the Davis Water Company to issue $37,125 of stock in lieu of $29,700 previously authorized.

A decision was rendered granting authority to the San Rafael and San Anselmo Valley Railway Company to issue $55,000 of stock and $45,000 of bonds for the purpose of constructing a street railroad from San Rafael to Fairfax.

A decision was rendered declaring excessive and unreasonable all the long distance telephone rates of the Pacific Telephone & Telegraph Company in California. The commission cut the rates 21 per cent, and allowed two minutes for conversation as against one minute heretofore allowed. The commission's order required that 30 per cent of long distance revenues be credited to city exchanges instead of 15 per cent.

The San Diego Consolidated Gas & Electric Company was granted authority to issue $41,000 of bonds under a previous order of the commission.

The Spring Valley Water Company applied for authority to issue $1,000,000 of notes. The company desires to use the proceeds to pay off existing indebtedness.

PUBLIC SERVICE COMMISSION—MONTANA.

The public service commission of this state has ordered a reduction in the rates charged by the Helena Light & Railway Company, to take effect immediately. The reduction ordered amounts to approximately 1.6c per kw.-hr., and it is estimated that this will result in a total saving of approximately $30,000 per annum to consumers. Both residence and commercial lighting rates are reduced and heating and cooking rates and sign, exterior and window lighting rates are ordered added to the present schedules. The residence rate in effect before the recent order of the commission was 12.6c per kw.-hr. This has been reduced to 11c per kw.-hr. The monthly minimum is ordered raised from 80c net to $1.00 net, with 5 per cent added if bills are not paid before the 10th of the month.

The business rate was 10.8c per kw.-hr. and this is ordered reduced to 10c flat. The minimum charge was ordered reduced from $1.60 per consumer to $1.00 per consumer.

An optional "readiness-to-serve" rate was ordered added. This applies only to yearly contracts and consists of a fixed charge of 25c per month per 60 watts installed and 5c per kw.-hr. for all current used.

A heating and cooking rate of 4c per kw.-hr. was also ordered inaugurated; also a flat rate of 8c per kw.-hr. for signs, window and exterior lighting burning until 11 o'clock; 7c if burned until 12 o'clock; and 6c if burned until 1 o'clock.

In its report the commission states that its decision is not based on a valuation of the property and the cost of oprating it, but that in arriving at the rates ordered the rates in effect in Billings, Mont., were used as a basis with certain modifications of the minimum charges.

BOOK REVIEWS.

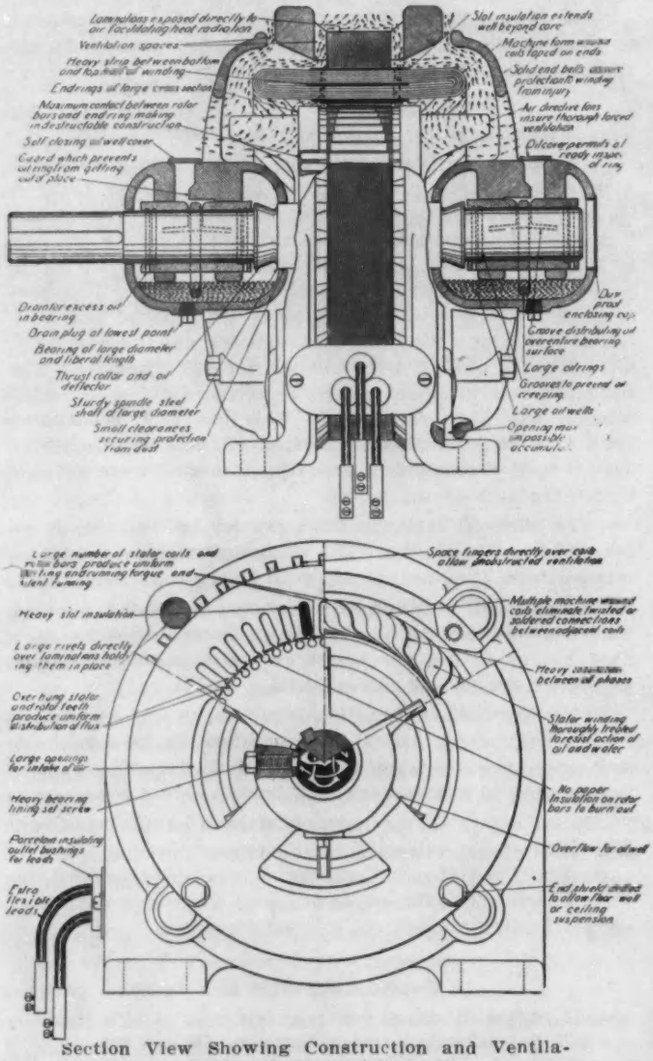
Electric Light & Motor Wiring. By Geo. J. Kirchgasser; 270 pp.; 4x2¾ in.; vest pocket size; leather bound. Published by The Electroforce Publishing Company, Milwaukee, and for sale by Technical Book Shop, Rialto Bldg., San Francisco. Price $1.00.

This practical book for the wiring contractor, electrical worker, electrical engineer, steam engineer, central station man, architect, or student, is invaluable as a ready reference. It may be continually to hand, as it can be carried in the vest pocket without inconvenience. It is compact but complete and tells in language which may be readily understood the methods of installing open knob, moulding, metal moulding, knob and tube work, flexible and rigid conduit and armored conductor systems. It contains over 150 illustrations which further aid the clear text. It does not simply develop the National Electric Code but tells how the installations are made and what the restrictions are for lighting and motor equipments. Methods are given for the calculation of wire sizes, and very complete motor and controller connections are given together with a number of valuable tables.

INDUSTRIAL

NEW TYPE OF INDUCTION MOTOR.

A new type of induction motor has recently been placed on the market by the U. S. Electrical Manufacturing Company of Los Angeles, Cal. The sectional view shown below conveys a good idea of the inside construction of the motor and shows plainly the ventilation characteristics. A riveted


Laminations exposed directly to air for labyrinth heat radiation
Ventilation spaces
Heavy strip between bottom and top half of winding
End rings of large cross section
Maximum contact between rotor bars and end ring making indestructible construction
Self closing oil well cover
Guard which prevents oil ring from getting out of place
Slot insulation extends well beyond core
Machine form windings coils taped on ends
Solid end bells assure protection of winding from injury
Air drawn into forced ventilation
Oil cover permits of ready inspection of ring
Drain for excess oil in bearing
Drain plug at lowest point
Bearing of large diameter and liberal length
Thrust collar and oil deflector
Sturdy spindle steel shaft of large diameter
Small clearances assuring protection from dust
Dust proof enclosing cap
Groove distributing oil over entire bearing surface
Large oil rings
Grooves to prevent oil creeping
Large oil wells
Large number of stator coils and rotor bars produce uniform starting and running torque and silent running
Space fingers directly over coils allow unobstructed ventilation
Heavy slot insulation
Multiple machine wound coils eliminate twisted or soldered connections between adjacent coils
Large rivets directly over laminations holding them in place
Heavy insulation between all phases
Overhung stator and rotor teeth produce uniform distribution of flux
Stator winding thoroughly treated to resist action of oil and water
Large openings for intake of air
No paper insulation on rotor bars to burn out
Heavy bearing lining set screw
Porcelain insulating outlet bushings for leads
Overflow for oil well
Extra flexible leads
End shield drilled to allow floor wall or ceiling suspension

Section View Showing Construction and Ventilation Characteristics.

frame is used instead of the usual cast iron type allowing the stator laminations direct contact with the outside air and at the same time contributing toward a very compact motor. At the present time it is made in sizes ¼ to 15 h.p.

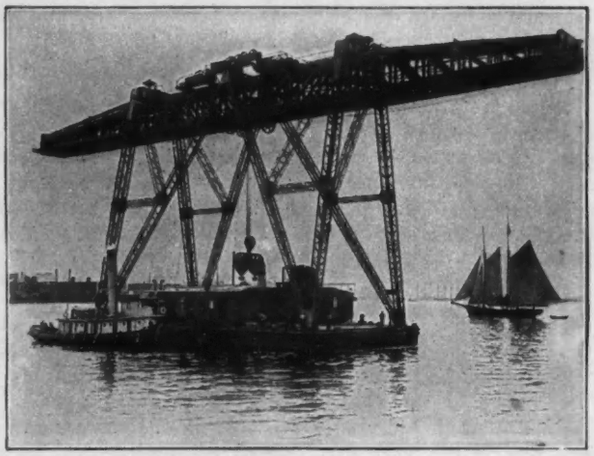
ASBESTOS METAL ROOFING AND SIDING.

Asbestos protected metal manufactured by the Asbestos Protected Metal Company of Beaver Falls, Pa., in the form of corrugated sheets is being used in large quantities as a permanent light roofing and siding material for covering tipples, washeries, breakers, pump houses and similar buildings in connection with coal mines. Asbestos protected metal makes possible skeleton incombustible steel construction of such buildings without the necessity of continued repainting and other maintenance expense.

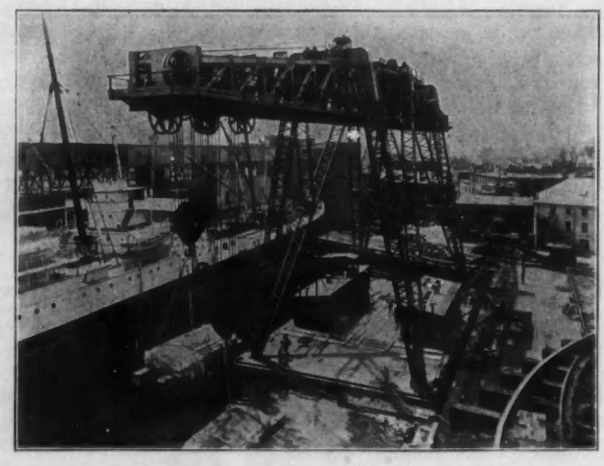
The service on such mine structures is particularly severe and especially where high sulphurous coals are produced. Both the inner and outer walls of such buildings are continually covered with a fine coal dust, which, when subjected to the action of rain water or moisture of condensation, forms a mild sulphuric acid solution which is deadly to the existence of unprotected metal sheets as well as of paint films.

ELECTRICAL CONTROL OF PONTOON CRANES.

The United States Navy Department has recently had built by the Wellman-Seaver-Morgan Company two 150-ton pontoon cranes, one of which is for Boston Harbor and the other for Pearl Harbor, Honolulu. These cranes are to be used for transferring to lighters and for putting in or removing turrets, guns, boilers and other machinery or apparatus used on battleships. The two tests by Navy Department engineers noted below are an indication of the accuracy of control provided by the Magnetic type controllers installed by The Cutler-Hammer Manufacturing Company of Milwaukee. In order to test nicety of landing heavy weight, the weight was suspended over an empty oil can with block on top of it, and then lowered so as to strike the block, being



U. S. Navy Department 150-Ton Pontoon Crane.



150-Ton Pontoon Crane in Operation.

stopped upon signal. It is possible to stop the load without injuring the oil can or deforming it. In order to further test this point, the weight was suspended about two inches over the block and then lowered to see how close it could be brought without touching, and was brought within 1/16 in. of the block.

NEWS NOTES

INCORPORATIONS.

LOS ANGELES, CAL.—The Earlimart Water Company has been incorporated here.

RIVERSIDE, CAL.—The Riverside Telephone Company has been incorporated here by A. W. Campbell, Hugh Miller, H. M. Fryer et al.

SAN FRANCISCO, CAL.—The Physicians and Surgeons Telephone Exchange has been incorporated with a capital stock of $10,000, shares $1 each, subscribed $3, by W. C. and Katherine L. Vivell and J. M. Litchfield.

ILLUMINATION.

SAN RAFAEL, CAL.—The city council has decided to place electroliers on Fourth and B streets, and assess the property owners on both sides of the street for the cost of the same.

EL CENTRO, CAL.—Seeley is to have an electric light and power line, extension to be made by the Holton Power Company from the El Centro plant. The work will be done this winter.

CONCORD, CAL.—The board of trustees has passed the application for a gas franchise applied for by S. Waldo Coleman to print and on January 12th will sell the franchise to the highest bidder.

GLENDALE, CAL.—The Southern California Gas Company has applied to the commission for a certificate of public convenience and necessity to exercise franchise rights in the city of Glendale, Los Angeles county.

SAN FRANCISCO, CAL.—Plans have been completed for a one-story and basement class A power station to cost $45,000 to $50,000 on S. Commercial, 60 W. of Montgomery, for the Pacific Gas & Electric Company by Architect F. H. Meyer.

REDLANDS, CAL.—The board of trustees has awarded the contract for the installation of 37 cast iron ornamental lighting posts along Central avenue, Vine street, Fifth and Fourth streets to the Southwest Electrical Company, for $2975.

SAN DIEGO, CAL.—A lighting system that will cost $100,000 is petitioned by residents of Point Loma. Property owners ask for the formation of an assessment district, to include the whole of Point Loma. The main thoroughfares will be lighted with arc lights on ornamental posts, according to plans.

TACOMA, WASH.—A preliminary estimate of $37,127.84 as the cost of installing a White Way street lighting system in Tacoma was submitted to the city council by B. W. Collins, superintendent of electric works, and a motion carried ordering a resolution to be ready at the next meeting of the commission for advertising for bids for the completion of the work.

SALT LAKE CITY, UTAH.—Work on the new commercial office of the Utah Light & Railway Company on Main street is progressing rapidly and the company expects to occupy their new quarters about December first. The company plan to make their new office "the brightest spot on Main street," and will have on the front of their building about forty kilowatts in tungsten lamps and flaming arc lamps.

TRANSMISSION.

COQUILLE, ORE.—Twenty-four hour service has been inaugurated by the Oregon Power Company, here. It is anticipated that considerable sales of appliances will result.

BOISE, IDAHO.—It is said that steps are being taken to foreclose the Idaho-Oregon Power Company at a bankrupt sale, and that whether or not the Idaho Power & Light Company would purchase it at such sale would depend upon the price at which it was sold.

LOS ANGELES, CAL.—The city council is preparing to take up immediately, as a committee of the whole, the matter of leasing the power companies' distributing systems. In the meantime, action on the bond issue of $6,500,000, for the completion of power plants and construction of distributing system, has been deferred. It is understood that the city attorney will submit a tentative contract between the power companies and the city, which contract will ultimately have to be referred to a popular vote.

SAN FRANCISCO, CAL.—John Coffee Hays, president of the Mt. Whitney Power & Electric Company, announces that they will expend $1,600,000 within the next 14 months on improvements and extensions of the service. The work on the Wolverton dam, located back of the Giant forest and power plant No. 5 will be rushed to completion, and extensive improvements will also be made at the Visalia steam generating plant. New substations of a modern type are to be put in at Woodville, Terra Bella, Goshen, Strathmore and Erlimart, and the stations at Delano and Exeter will be increased in size.

GOLD HILL, ORE.—Work has commenced upon the power site of the Rogue River Public Service Corporation just east of this city, for the development of power required by its contract with the Beaver-Portland Cement Company. Next summer the work of constructing a permanent dam for the development of 5000 h.p., and the installation of a suitable plant, will be rapidly pushed to completion. Permit has already been secured under authority of the state. The Rogue River Public Service Corporation are successors to the Oregon Water & Power Company of which H. D. Reed was local manager.

OAKLAND, CAL.—An ordinance of intention to submit the question to the electors of this city whether the city of Oakland shall retain its power of control respecting certain classes of public utilities was passed in the city council on motion of Mayor Mott. In his address to the council the Mayor said: "The situation in Oakland with relation to public utilities is somewhat different from that of other cities in the state. We have here a number of public service corporations, which are serving not only Oakland, but adjoining cities as well, and there is a co-relation of interests in this regard that makes the question of rate fixing and other regulation of more than merely local concern. Better results would obtain not only to our city, but to all contiguous communities if the state railroad commission would be given power to handle the situation from the standpoint of the entire district rather than in detail."

TRANSPORTATION.

NAPA, CAL.—Plans are announced by the Northern Electric for the construction of a branch line from Napa Junction to Napa as a feeder to the company's San Francisco-Sacramento line, now under construction.

OAKLAND, CAL.—The first step in separating the management of the Southern Pacific's electric system of the east bay cities from that of the steam railroad system was taken when a superintendent was appointed for the electrical system.

SAN FRANCISCO, CAL.—The issuance of transfers between the municipal railway and the United Railroads at Kearny street and at Larkin street, has begun. The transfers from the Geary street road are good on both north and southbound cars of the United Railroads.

OAKLAND, CAL.—The Oakland, Antioch & Eastern Railway has entered into an agreement with the Pacific Navigation Company, whereby passengers from the south may purchase through tickets for any point on the Oakland and Antioch line. The interurban line will sell through passage to Los Angeles, good on the Yale and Harvard.

SAN FRANCISCO, CAL.—The public utilities committee of the supervisors has decided in favor of side instead of center poles for Van Ness avenue to support the trolley wires of the branch municipal railway line. In order that as much space as possible may be secured in the roadway it is the plan of City Engineer O'Shaughnessy to have the sidewalks cut from 22 to 18 ft. wide.

LOS ANGELES, CAL.—The Pacific Electric Railway Company is preparing to utilize the municipal railway on San Pedro street as soon as it is completed. Until the elevated structure is erected, from the rear of the depot to San Pedro street, it is the purpose of the railway company to utilize the Seventh street service tracks. The elevated franchise will be brought up for action before the city council this week.

CASPAR, WYOMING.—Attorney Richard E. Shipp recently made application to the city council for a street car franchise in this city. Mr. Shipp claims to represent interests with sufficient backing to build the system at once. A line from the Franco Refinery No. 1 east of town down Second street to the Midwest Refinery on the west, is proposed, also from the Burlington depot up Center street to the southern boundaries of the city.

VISALIA, CAL.—The city trustees have granted a franchise to the Big Four Electric Railway to operate a city street car system in connection with its interurban line now building between Visalia and Tulare. A bond of $500 will be posted to insure the performance of the conditions of the franchise. Work must be started in 60 days, and completed in two years. All of the grade on the interurban line except a few miles, has been completed. It is expected the road will be in operation this winter.

SAN FRANCISCO, CAL.—The supervisors passed to print the ordinance granting the Southern Pacific Company a new franchise to cover changes of track and building in Townsend street, but without eliminating conditions to which the company had objected. It was said the free-switching condition, if insisted on and carried out, would mean a saving to business men of $300,000 a year. Other conditions give the city cars a right of way over the company's tracks, and provide that the company shall not only keep the pavements in order, but also shall light the streets.

SAN RAFAEL, CAL.—The promoters of the proposed San Anselmo Valley Electric Railroad have been granted authority by the railroad to build the road which will connect San Rafael at a point near the Union station with San Anselmo and Fairfax. A single 5c fare is to be charged. The commission authorized an issue of $55,000 in stock and $45,000 bonds, all to be sold at par. In its order the commission provides that no work may be begun upon the project until 90 per cent of the stocks and bonds shall have been subscribed and $50,000 paid in and placed in the bank.

LOS ANGELES, CAL.—The railroad commission has been considering the proposition of track elevation on Alameda street at its session held in Los Angeles during the past week. This has developed into a controversy with many angles. On the one hand there is the Southern Pacific, with plans completed and contract ready to let for the new depot on the Arcade site. There is the railroad commission, seeking to solve the grade crossing problem in an impartial manner. Then again, there are certain commercial interests for and against track elevation and the depot proposition in general, according to the benefits to be derived or damages to be caused, due to the adoption of any report which may be made by the commission. If the tracks are elevated there will be a tremendous loss or inconvenience to certain commercial interests now served by spurs from existing service tracks. The city council has practically given its consent for the immediate construction of the depot, but it is probable that the plans will be held in abeyance for some weeks yet, due to an undefined but localized opposition.

TELEPHONE AND TELEGRAPH.

VENTURA, CAL.—The Pacific Telephone & Telegraph Company's application for a new 30-year franchise to be offered for sale has been granted by the board of trustees. and the proposed franchise will be sold at public auction on December 15th.

ESCONDIDO, CAL.—N. K. Gray, line manager for the Pacific Telephone & Telegraph Company, is making arrangements for rebuilding the telephone line between Escondido and Ramona, three miles of which was destroyed in brush fires in September.

PLACERVILLE, CAL.—The supervisors have sold to C. R. Lorraine et al. the right to construct a rural telephone line along the Green Valley road, from Rescue to the Sacramento county line, and along the Deer Valley Road, and to operate the same for a period of 50 years.

SAN FRANCISCO, CAL.—The Marconi Wireless Telegraph Company of America announces reduced rates, effective immediately, to and from vessels at sea. Coastwise vessel charges have been reduced to 5c per word, and forwarding charges to inland points over the land wires has also been reduced.

LOS ANGELES, CAL.—The city council has abolished the position of electrical engineer, bureau of fire alarm and police telegraph. The bureau has been placed under the jurisdiction of the department of electricity, and an advisory board, consisting of the mayor and the chiefs of the fire and police departments, will have a general supervision over its affairs. City Electrician Manahan will supervise the construction and operation of the system.

SAN FRANCISCO, CAL.—The railroad commission has declared excessive and unreasonable all the long distance telephone rates maintained within the state of California by the Pacific Telephone & Telegraph Company and substituted an entirely new and reduced schedule. The commission cuts the present long distance rates of the telephone company by 21 per cent and in a sum amounting to $526,000 per year. The commission finds that the schedule which the telephone company desired to maintain yielded a return in excess of 14 per cent. The rates as fixed by the commission are calculated to yield slightly in excess of 9 per cent. The new rates go into effect on February 16th and the result will be a realignment upon a reduced basis of nearly all of the long distance telephone charges within the state. The commission fixes the rate at ½c per air line mile for minute conversation, with 50 per cent increase for every additional minute or fraction thereof. The commission requires 30 per cent of long distance revenues to be credited to city changes. The company heretofore allowed 15 per cent. The decision divides the state into blocks and sections for rate purposes following postal route zones.

SPOKANE, WASH.—John E. Davies, general counsel, vice-president and secretary of the Interstate Consolidated Telephone Company, on cross-examination in the government's investigation into an alleged telephone trust, admitted that a subsidiary of the American Telephone & Telegraph Company had purchased control of the Lane independent companies in Idaho, Montana and Washington. Former testimony of Davies indicated that the Bell company had bought stock, but not control. Officials and counsel of the American Telephone & Telegraph Company also admitted control of the Lane independent companies, and cited that such control was stated in an answer filed in the Federal Court in Seattle in June, 1912. The Bell companies have control through the Corporation Securities & Investment Company.